

FINAL
CONNECTICUT RIVER BASIN
WHATELY, MASSACHUSETTS

FOUNDATIONS & MATERIALS
BRANCH

NORTHAMPTON RESERVOIR
(LOWER DAM)
MA 00520

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The dam is a 1200 ft. long, 23 ft. high earth embankment dam. The visual inspection of the dam did not disclose any immediate stability problems. It is recommended that the seepage condition below the tow of the dam be investigated and an adequate collection and monitoring system be designed.		

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

BRIEF ASSESSMENT

Identification No.: MA. 00520
Name of Dam: Northampton Reservoir (Lower Dam)
Town: Whately
County and State: Franklin County, Massachusetts
Stream: West Brook
Date of Inspection: May 25, 1978

This dam is a 1200' long, 23' high earth embankment dam. Minimal engineering data is available consisting only of a drawing dated 1901 showing plan, elevations and typical dam and spillway sections. No construction records or design calculations are available. Construction was completed in 1903.

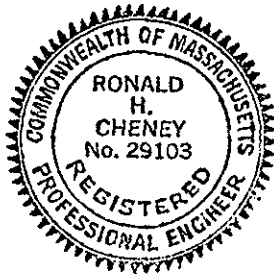
The visual inspection of the dam did not disclose any immediate stability problems. There is a large area of standing water at the downstream toe of the dam which indicates substantial leakage through or beneath the dam. Areas of the spillway outlet channel, which is concrete and stone paved, are spalled and eroded.

Based on size and hazard classifications in accordance with Corps guidelines, the test flood is $\frac{1}{2}$ Probable Maximum Flood. The spillway is not capable of passing this test flood, without overtopping the dam, when discharge from the upper dam at this two dam complex is considered.

It is recommended that the seepage condition below the toe

of the dam be investigated and an adequate collection and monitoring system be designed. The spalled, eroded areas of the spillway outlet channel should be repaired. The rotted wood and loose hand rail on the service bridge need repairing and the small trees should be removed from between the joints of the granite blocks at the gate house and the joints mortared. Since the spillway will not pass the required flow of $\frac{1}{2}$ PMF (significant hazard classification) an indepth hydraulic analysis should be made for this two dam complex. A plan of operation for the complex can then be implemented such as operating the upper and/or lower dam at less than spillway crest level to allow for proper storage during periods of peak runoff. Increased spillway capacity should also be considered. If weather bureau forecasts give potential for flood conditions prior to the implementation of the preceding then this reservoir should be lowered to allow for increased storage.

The urgency of these recommendations varies and is given in Section 7.1c of this report.



Ronald H. Cheney

Ronald H. Cheney, P.E.
Associate

Hayden, Harding & Buchanan, Inc.
Boston, Massachusetts

PREFACE

This report is prepared under guidance contained in Department of the Army, Office of the Chief of Engineers, Recommended Guidelines for Safety Inspection of Dams, for a Phase I Investigation. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external

conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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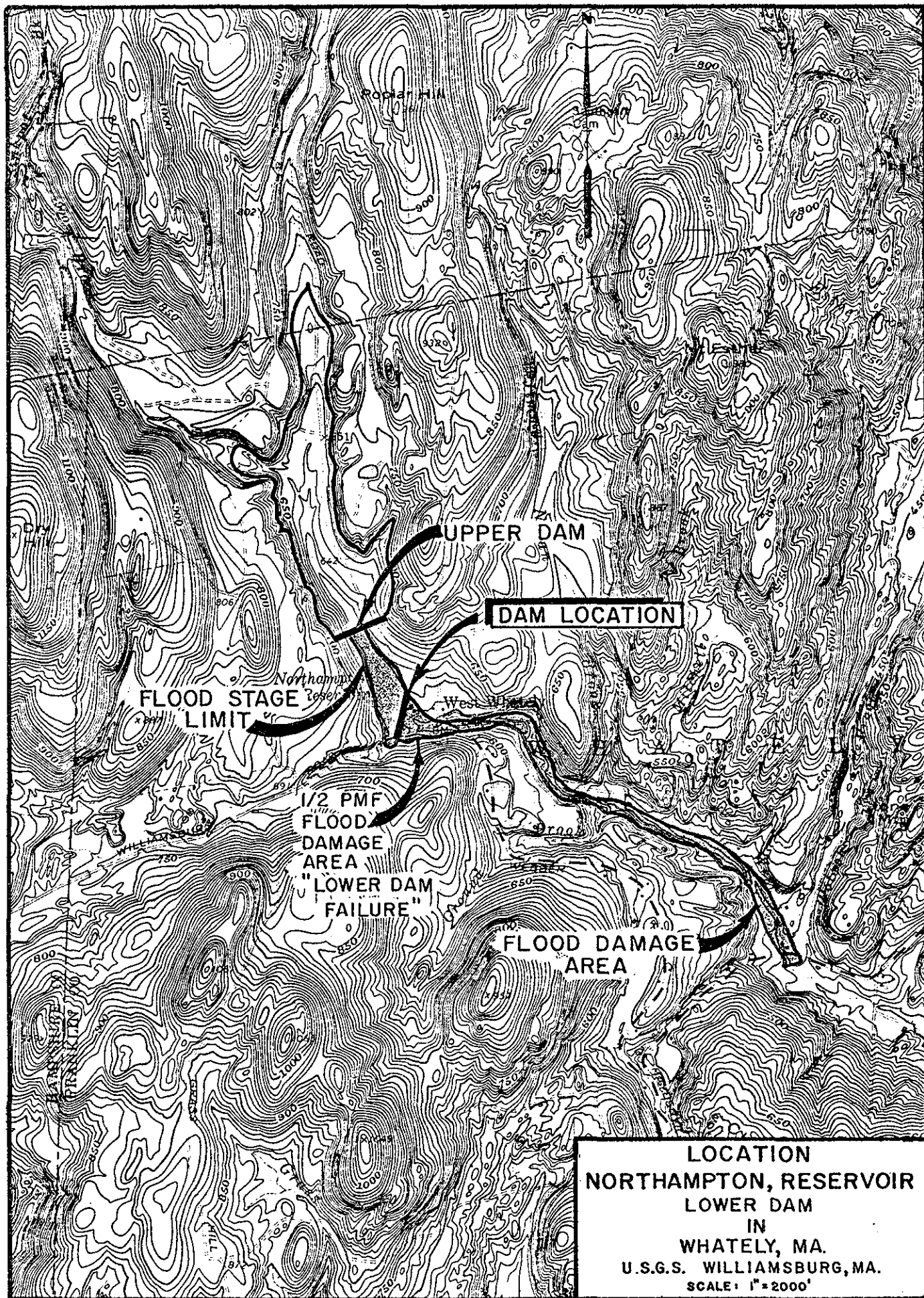
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PHASE I
INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
NORTHAMPTON RESERVOIR (LOWER DAM)

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority.

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Hayden, Harding & Buchanan, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed was issued to Hayden, Harding & Buchanan, Inc. under a letter of May 3, 1978, from Mr. Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW 33-78-C-0307 has been assigned by the Corps of Engineers for this work.

b. Purpose

(1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

Section 1.1 Continued

(2) Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.

(3) To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location

Northampton Reservoir Lower Dam is located in the Town of Whately in Franklin County, Massachusetts.

b. Dam and Appurtenances

The dam is a 1200' long, 23' high earth embankment dam with a 2:1 riprap upstream slope and a 1½:1 turfed downstream slope. A Concrete Core wall is provided at midsection. The Spillway has a center core wall of stone masonry with a 3:1 approach slope and a stone paved 5:1 exiting channel. The training walls are stone masonry and serve as abutments for a roadway truss bridge which spans the spillway.

A gate structure described in Section 3.1c is located at the approximate 1/3rd point along the length of the dam. This structure contains a 20" dia. C.I. pipe which feeds the water supply system, and a 30" dia. C.I. waste pipe.

c. Size Classification

This dam falls into the small size classification due to its hydraulic height and storage capacity of 23 feet and 99 a.f. respectively.

Section 1.2 Continued

d. Hazard Classification

This dam falls into a significant hazard classification for potential damage. Approximately five habitable structures could be damaged by flood waters.

e. Ownership

The dam is owned by the City of Northampton and has always been part of their water supply system.

f. Operator

The dam is maintained and operated by the Board of Public Works - Water Division, located at 237 Prospect Street, Northampton, MA. Mr. Leon Murray is the Superintendent of the Water Division. Telephone - (413) 584-1401.

g. Purpose of Dam

The purpose of this dam is water supply. Water is drawn from this reservoir through the 20" dia. C.I. pipe to feed the Mountain Street Reservoir some 2.5 miles away.

h. Design & Construction History

The drawings for the dam were made in 1901 and construction completed in 1903. There is no in-depth design or construction data available for this site.

1.3 Pertinent Data

a. Drainage Area

The main drainage area is about 1180 acres (1.82 S.M.) and extends to the westerly side of the dam. The northerly

Section 1.3 Continued

part of the reservoir is bounded by a new dam built in 1970 which intercepts runoff from 2897 acres (4.52 s.m.) of land.

The areas contributing storm runoff to the dam are wooded with rolling slopes. One swamp area (10 to 20 acres) is within the drainage area. The longest watercourse is the Henhawk Brook. It has a length of about two miles with a change in elevation of 500 feet. The brook passes through the swamp for a distance of about 1500 feet.

b. Discharge at Dam Site

This dam was not damaged during the August 1955 flood and adequately handled runoff from the entire 4077 acre (6.37s.m.) drainage area. The actual maximum flow, however, is unknown. The spillway is ungated and has a capacity of 2000± cfs (314 csm) at a pool elevation of 601±.

c. Elevation (ft. above MSL)

- (1) $\frac{1}{2}$ PMF surcharge - 603±
- (2) Top Dam - 601.00
- (3) Water supply pool - varies 596 or less
- (4) Spillway crest (gated) - not gated 596
- (5) Upstream portal invert diversion tunnel - None
- (6) Streambed at centerline of dam - 581.00±
- (7) Maximum tailwater - 593±

d. Reservoir

- (1) Length of water supply pool - 1600'±
- (2) Length of $\frac{1}{2}$ PMF pool - 1800'±

Section 1.3 Continued

e. Storage (acre-feet)

- (1) Water Supply pool - 42±
- (2) Top of dam - 99±
- (3) $\frac{1}{2}$ PMF surcharge - 121±

f. Reservoir Surface (acres)

- (1) Water supply pool - varies, no records (10±)
- (2) Top dam - 12±
- (3) $\frac{1}{2}$ PMF pool - 12±

g. Dam

- (1) Type - gravity, earth embankment
- (2) Length - 1200'
- (3) Height - 31' (structural incl. 8' cutoff)
- (4) Top Width - 12'
- (5) Side Slopes - $1\frac{1}{2}$:1 D.S., 2:1 U.S.
- (6) Zoning - not indicated or known
- (7) Impervious Core - Concrete
- (8) Cutoff - 8' concrete
- (9) Grout curtain - Not known

i. Spillway

- (1) Type - Stone Masonry
- (2) Length of weir - 50'
- (3) Crest elevation - 596.00
- (4) Gates - None
- (5) U/S Channel - Concrete apron, 3:1 slope
- (6) D/S Channel - Stone masonry in concrete, slope varies
- (7) General - Bridge over spillway - could cause restriction.

Section 1.3 Continued

j. Regulating Outlets

Regulating outlets are a 30" cast iron drain and a 20" cast iron water supply pipe. Both are controlled with manual gate valves. The inverts of both pipes are unknown.

SECTION 2 ENGINEERING DATA

2.1 Design

A drawing dated 1901 showing plan, elevation and typical dam and spillway sections, located at the Northampton Water Department, was the only engineering data found.

In-depth engineering calculations for the dam and spillway design and hydraulic consideration are non-existent.

2.2 Construction

Construction records of the dam are non-existent.

2.3 Operation

No operational manual for this dam exists.

2.4 Evaluation

a. Availability

This dam was designed by Davis Engineering, now known as Almer Huntley Assoc. of Northampton. The Water Divisions Superintendent has had the records of this engineering company searched for additional data. No additional data has been found.

b. Adequacy

The lack of in-depth engineering data does not allow for a definitive review of such data. Therefore, the adequacy of this dam structurally and hydraulically cannot be assessed from the review of design calculations but must be based primarily on the visual inspection, past performance history and hydrologic and hydraulic assumptions.

Section 2.4 Continued

c. Validity

The visual inspection of the dam site shows that the external features substantially agree with those shown on the furnished plan.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General

The Northampton Reservoir Lower Dam was inspected on May 25, 1978. At that time, water was passing over the spillway one inch deep. Therefore, the upstream slope and appurtenant structures were inspected above the water surface.

b. Dam

Visual inspection of the embankment showed no signs of distress. There is a large area of standing water at the downstream toe of the dam which indicates that there is substantial leakage through or beneath the dam. This condition has been reported in previous inspection reports dating back to 1970. Mr. Leon Murray of the Northampton Board of Public Works has indicated that this seepage condition has existed since he joined the Board in the 1940's.

Upstream Slope

Only the upper 5 feet of the upstream slope was visible at the time of inspections. Photos 1 and 2* show the entire upstream slope above approximate elevation 596.

The riprap protection has been infilled with soil and grass but is in place. No surface erosion was noted on the upstream slope.

*See Appendix C for these and all subsequent photos.

Section 3.1 Continued

Crest

The crest of the dam has no pavement. No evidence of erosion or cracking of the embankment was observed.

Downstream Slope

The face of the downstream slope was traversed along two lines, (1) along the crest; (2) along the toe.

The slope is in good condition with a good turf and grass cover. There are small bushes up to 3 feet high growing on the slope which should be removed as part of normal dam maintenance. The owner normally cuts the grass and cleans the slope each spring; our inspection was performed before this routine maintenance had been performed.

There is a large area immediately downstream of the dam which has standing water due to seepage from the dam or its foundation. The extent of this area can be seen in Photo 5. The area extends about 200 ft. along the toe and proceeds downstream to the Williamsburg Road in an approximately triangular pattern with the base of the triangle at the dam toe.

This seepage area has been noted in early reports dating to 1970. Mr. Leon Murray of the Northampton Board of Public Works has indicated that this seepage condition has existed since he joined the Board in the 1940's.

An old drawing, on file at the Northampton Water Division indicates that the channel of West Brook, which was

Section 3.1 Continued

dammed, runs through the area of seepage. The original course of Nash Brook passes through the seepage area and intersected West Brook within the seepage area.

The extent of the seepage from this dam is large, the fact that the seepage has existed for over thirty years with no visible effect on the dam indicates that the dam is not likely to be an immediate safety hazard. However, present day design standards would not allow such an uncontrolled seepage condition to exist below the dam. It is recommended that the owner engage a qualified consulting engineer to investigate the cause of the seepage and to design a proper collection system downstream of the dam that would allow periodic measurement of the quantity and turbidity of the seepage water.

An effort has been made in the past to collect the surface water below the dam and channel it to an inlet into the reservoir drain pipe. This design was not adequate.

c. Appurtenant Structures

The gate house was inspected to the water surface. This structure is of granite stone masonry construction with a wood floor, brick superstructure and wood roof. Small trees are growing from some of the joints between the masonry where mortar is missing.

The service bridge is of wood deck, steel stringer construction. The wood is badly weathered and rotted and the steel hand rail is loose and unsafe.

Section 3.1 Continued

d. Reservoir Area

The general area of the reservoir consists of wooded hills with rolling slopes. The Northampton Reservoir Upper Dam is located immediately above the upstream end of this reservoir's reach. A detailed description of the drainage area is given in Section 1.3a of this report. Siltation within the reservoir is unknown.

e. Downstream Channel

The downstream channel is a natural stream bed, surrounded by wooded area. The stream is flowing freely. The area immediately below the spillway crest is stone and concrete paved. Much of this area is spalled and eroded away. This condition has been reported in past State Inspection Reports. Due to the water flow over the spillway area, it was difficult to determine the underlying material at these locations, and the degree of erosion seriousness at the time of this inspection. Subsequently this area was reinspected on July 6, 1978. At this time no water was passing the spillway. The channel immediately below the spillway is constructed of hand placed boulders which at some date were grouted in place. At many locations the concrete has eroded and spalled away. This has allowed water to dislodge some of the hand placed boulders. This condition however does not pose a serious problem to the safety of the dam at this time. The training walls which serve

Section 3.1 Continued

as abutments for the roadway truss bridge are true and plumb and in generally good condition.

3.2 Evaluation

Visual examination indicates no immediate safety problem, however, the cause of extensive seepage downstream of the toe should be investigated and a seepage collection system designed. Also the spalled area of the spillway outlet channel along with the rotted wood and loose hand rail on the service bridge should be repaired.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures

The reservoir retained by this dam is used to supply water to the City of Northampton. Normally, the gate on the 20" dia. supply line is open, thereby feeding water to the system. The 30" dia. waste pipe is normally closed.

4.2 Maintenance of Dam

The downstream slope of this dam is cut annually by the City. Animal burrows are also looked for and repaired as required at this time.

4.3 Maintenance of Operating Facilities

The operating gates which control flow to the 20" dia. supply line and the 30" dia. waste line are operated annually by the City.

4.4 Description of Warning Systems

There are no warning systems in effect for this dam.

4.5 Evaluation

The basic maintenance procedures of cutting turf, fixing burrow holes and operating the control gates appears adequate for this facility. However, the dam should be inspected annually by qualified personnel who can identify areas of concern which, if left unchecked, could jeopardize the safety of the dam.

SECTION 5
HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data

There are no hydraulic design calculations available for this site.

b. Experience Data

The Superintendent of the Water Division reported that there was no damage evident to this dam during the August 1955 flood. The actual flow at the spillway during this flood, however, was not monitored and is therefore unknown. This dam was also subjected to the floods of Nov. 1927, March 1936, Sept. 1938 and October 1955.

c. Visual Observations

Visual observations of the drainage area and general vicinity show it to be generally as indicated on the U.S.G.S. Map. This is described in Section 1.3 of this report.

d. Overtopping Potential

This dam carries a small dam classification with a significant hazard potential. As such, it should be capable of passing maximum flow of $\frac{1}{2}$ PMF. The test flood was computed by determining the watershed drainage area from USGS maps in combination with Corps discharge guide curves. This flow also

Section 5.1 Continued

includes the $\frac{1}{2}$ PMF input to this site by the spillway of the dam immediately north of this location. (Upper Reservoir, MA. 00521).

Considering the storm runoff from the 1180 acre (1.85 s.m.) drainage area and the upper dam input, a total of 6182 cfs (970 csm) will pass through the Lower Dam. This $\frac{1}{2}$ PMF will overtop the lower dam to an approximate depth of 2 feet (El. 603 \pm). As previously mentioned, the spillway has a discharge capacity of 2000 cfs (314 csm) at elevation 601 \pm .

Using the "rule-of-thumb" method, the effects of overtopping damage were determined, assuming failure of this dam. When the dam is overtopped, the automobile bridge at the spillway will be washed out (this bridge presents a possible blockage point, for trees, at lesser flood flows). Within 1000 feet of the dam, 5 inhabited structures would be struck by the water's wave. Significant damage to these structures is indicated by using U.S.G.S. elevations.

No structures are close to the stream again until 6000 to 8000 feet downstream near the Haydenville road. Along this length, 6 structures could be damaged by flood water. Damage might be significant here since these structures are close to the stream bed.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

The visual inspection did not disclose any immediate stability problems.

b. Design and Construction Data

The drawing in Appendix B summarizes the available information about the design of the dam. No specifications are available.

c. Operating Records

No operating records were made available.

d. Post-construction Changes

A gravel-filled trench drain and a drop inlet leading to the dam drain were constructed to collect the excessive seepage which occurred at this site.

This collection system has not been adequate to prevent significant uncontrolled seepage downstream.

e. Seismic Stability

The dam is located in Seismic Zone 2 according to U.S. Corps of Engineer guidelines and does not require a special analysis for seismic stability. Since the dam has an old concrete or masonry core wall, earthquake shaking could cause cracking of the wall. This possibility supports the need for designing a seepage collection system downstream of the dam.

SECTION 7
ASSESSMENT, RECOMMENDATIONS -
REMEDIAL MEASURES

7.1 Dam Assessment

a. Conditions

The visual inspection did not disclose any findings that indicate an immediate unsafe condition.

b. Adequacy of Information

The information available is such that the assessment of the safety of the dam must be based primarily on the visual inspection and the past performance of the structure.

c. Urgency

The recommendations and remedial measures presented in Sections 7.2 and 7.3 should be implemented by the owner within two to four years. The exception is the remedial measure 7.3b(4) which should be implemented within six months to one year.

d. Necessity of Additional Investigations

The findings of the visual inspection do not warrant additional investigation; however, the owner should engage a qualified consultant to evaluate the seepage condition at the downstream toe in sufficient detail to permit the design of a seepage collection and monitoring system.

7.2 Recommendations

a. The wood walkway on the gate house service bridge should have all rotted wood replaced and the steel handrail should be securely fastened in place.

Section 7.2 Continued

b. The small trees growing from between the granite block joints of the gate house should be removed. All joints should be mortared as required.

7.3 Remedial Measures

Although this dam is in generally good condition it is considered important that the following items be accomplished.

a. Alternatives

This dam's spillway does not have the capacity to pass the $\frac{1}{2}$ PMF when flow from the upper dam's spillway at $\frac{1}{2}$ PMF is added to the drainage area inflow. The spillway is adequate when only the drainage area of 1.84 square miles for this dam is considered. Further hydraulic studies by competent consulting engineers are necessary to determine what alternative measures are necessary to improve spillway discharge capabilities.

This study could possibly lead to the following conclusions:

- 1) Operate upper dam at less than full capacity to provide increased storage at peak runoff times.
- 2) Increase spillway capacity of this dam.
- 3) Operate this dam at less than full capacity to provide increased storage.
- 4) Combination of the above.

Section 7.3 Continued

b. Operation and Maintenance Procedures

1) The owner should have a qualified consultant investigate the seepage condition below the toe of the dam and design an adequate collection and monitoring system.

2) The area of the downstream channel immediately below the spillway as outlined in Section 3.1e of this report should be repaired. This repair should consist of replacing in kind the dislodged hand placed boulders or filling the voids with concrete.

3) This dam should be inspected annually by qualified personnel who can identify areas of concern which, if left unchecked could jeopardize the safety of the dam.

4) Because of the relationship of the upper and lower dams, around the clock surveillance should be provided during periods of unusually heavy precipitation. In addition the owner should develop a formal system for warning downstream residents in case of emergency.

APPENDIX A

VISUAL INSPECTION CHECK LIST

VISUAL INSPECTION CHECK LIST

PARTY ORGANIZATION

PROJECT Northampton Watery Complex
Lower DamDATE May 25, 1978TIME 3:15WEATHER Partly sunny 70°W.S. ELEV. 596.1 U.S. _____ DN.S. _____

PARTY:

- | | |
|-------------------------|-----------|
| 1. <u>Ron Cheney</u> | 6. _____ |
| 2. <u>Dan LaGatta</u> | 7. _____ |
| 3. <u>Craig Nehring</u> | 8. _____ |
| 4. _____ | 9. _____ |
| 5. _____ | 10. _____ |

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>Embankment Dam</u>	<u>D.P. LaGatta</u>	
2. <u>Intake Structure & Control Structure</u>	<u>Ron Cheney</u>	
3. <u>Spillway</u>	<u>Ron Cheney</u>	
4. <u>Service Bridge</u>	<u>Ron Cheney</u>	
5. _____		
6. _____		
7. _____		
8. _____		
9. _____		
10. _____		

PROJECT Northampton Watery ComplexDATE May 25, 1978PROJECT FEATURE Lower DamNAME D. P. LaGattaDISCIPLINE Geotechnical Engineer
Structural EngineerNAME R.H. Cheney

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT</u>	
Crest Elevation	601.0
Current Pool Elevation	596.1
Maximum Impoundment to Date	Unknown
Surface Cracks	None observed.
Pavement Condition	No pavement.
Movement or Settlement of Crest	None observed.
Lateral Movement	None observed.
Vertical Alignment	No misalignment observed.
Horizontal Alignment	No misalignment observed.
Condition at Abutment and at Concrete Structures	Good.
Indications of Movement of Structural Items on Slopes	None observed.
Trespassing on Slopes	None observed.
Sloughing or Erosion of Slopes or Abutments	None observed.
Rock Slope Protection - Riprap Failures	No riprap.
Unusual Movement or Cracking at or near Toes	None observed.
Unusual Embankment or Downstream Seepage	See detailed description in Section 3.1 of report.
Piping or Boils	No boils observed.
Foundation Drainage Features	Unknown.
Toe Drains	Unknown.
Instrumentation System	None.

PERIODIC INSPECTION CHECK LIST

PROJECT Northampton Watery Complex

DATE May 25, 1978

PROJECT FEATURE Lower Dam

NAME D. P. LaGatta

DISCIPLINE Geotechnical Engineer
Structural Engineer

NAME R. H. Cheney

AREA EVALUATED	CONDITIONS
<p><u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u></p> <p>a. Approach Channel</p> <p>Slope Conditions</p> <p>Bottom Conditions</p> <p>Rock Slides or Falls</p> <p>Log Boom</p> <p>Debris</p> <p>Condition of Concrete Lining</p> <p>Drains or Weep Holes</p> <p>b. Intake Structure</p> <p>Condition of Concrete</p> <p>Stop Logs and Slots</p>	<p>This facility has no approach channel.</p> <p>Granite stone masonry structure with wood floor, brick super-structure, and wood roof.</p> <p>Small trees are growing from joints between granite blocks.</p>

PERIODIC INSPECTION CHECK LIST

PROJECT Northampton Watery ComplexDATE May 25, 1978PROJECT FEATURE Lower DamNAME D. P. LaGattaDISCIPLINE Geotechnical Engineer
Structural EngineerNAME R. H. Cheney

AREA EVALUATED	CONDITIONS
<p><u>OUTLET WORKS - CONTROL TOWER</u></p> <p>a. Concrete and Structural</p> <p>General Condition</p> <p>Condition of Joints</p> <p>Spalling</p> <p>Visible Reinforcing</p> <p>Rusting or Staining of Concrete</p> <p>Any Seepage or Efflorescence</p> <p>Joint Alignment</p> <p>Unusual Seepage or Leaks in Gate Chamber</p> <p>Cracks</p> <p>Rusting or Corrosion of Steel</p> <p>b. Mechanical and Electrical</p> <p>Air Vents</p> <p>Float Wells</p> <p>Crane Hoist</p> <p>Elevator</p> <p>Hydraulic System</p> <p>Service Gates</p> <p>Emergency Gates</p> <p>Lightning Protection System</p> <p>Emergency Power System</p> <p>Wiring and Lighting System in Gate Chamber</p>	<p>Control tower and intake structure are one and the same. See comments preceding for intake structure.</p> <p>All gates are manually operated.</p> <p>City checks gates for operational ability once a year.</p> <p>20" C.I. Supply open.</p> <p>30" C.I. Waste closed.</p>

PERIODIC INSPECTION CHECK LIST

PROJECT Northampton Watery ComplexDATE May 25, 1978PROJECT FEATURE Lower DamNAME D. P. LaGattaDISCIPLINE Geotechnical EngineerNAME R. H. CheneyStructural Engineer

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - TRANSITION AND CONDUIT</u>	
General Condition of Concrete	There is no transition and Conduit.
Rust or Staining on Concrete	20" dia C.I. Supply and
Spalling	30" dia C.I. Waste pipe only.
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

PERIODIC INSPECTION CHECK LIST

PROJECT Northampton Watery ComplexDATE May 25, 1978PROJECT FEATURE Lower DamNAME D. P. LaGattaDISCIPLINE Geotechnical EngineerNAME R. H. CheneyStructural Engineer

AREA EVALUATED	CONDITIONS
<p><u>OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL</u></p> <p>General Condition of Concrete</p> <p>Rust or Staining</p> <p>Spalling</p> <p>Erosion or Cavitation</p> <p>Visible Reinforcing</p> <p>Any Seepage or Efflorescence</p> <p>Condition at Joints</p> <p>Drain Holes</p> <p>Channel</p> <p>Loose Rock or Trees Overhanging Channel</p> <p>Condition of Discharge Channel</p>	<p>No outlet structure.</p> <p>Waste pipe empties directly into brook beyond Williamsburg Road located down stream of Dam.</p> <p>None.</p> <p>Good.</p>

PERIODIC INSPECTION CHECK LIST

PROJECT Northampton Watery ComplexDATE May 25, 1978PROJECT FEATURE Lower DamNAME D. P. LaGattaDISCIPLINE Geotechnical EngineerNAME R. H. CheneyStructural Engineer

AREA EVALUATED	CONDITIONS
<p><u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u></p> <p>a. Approach Channel</p> <p>General Condition</p> <p>Loose Rock Overhanging Channel</p> <p>Trees Overhanging Channel</p> <p>Floor of Approach Channel</p> <p>b. Weir and Training Walls</p> <p>General Condition of Concrete</p> <p>Rust or Staining</p> <p>Spalling</p> <p>Any Visible Reinforcing</p> <p>Any Seepage or Efflorescence</p> <p>Drain Holes</p> <p>c. Discharge Channel</p> <p>General Condition</p> <p>Loose Rock Overhanging Channel</p> <p>Trees Overhanging Channel</p> <p>Floor of Channel</p> <p>Other Obstructions</p>	<p>This facility has no approach channel.</p> <p>Spillway consists of a cut stone crest, a 6 foot upstream concrete apron and a concrete and stone pavement down stream.</p> <p>Training walls are granite block with some joints mortared. Walls serve as abutments for a roadway truss bridge. Walls are true and plumb.</p> <p>Good.</p> <p>None observed.</p> <p>Yes, but not significant.</p> <p>Boulder strewn.</p> <p>None.</p>

PERIODIC INSPECTION CHECK LIST

PROJECT Northampton Watery ComplexDATE May 25, 1978PROJECT FEATURE Lower DamNAME D. P. LaGattaDISCIPLINE Geotechnical Engineer
Structural EngineerNAME R. H. Cheney

AREA EVALUATED	CONDITIONS
<p><u>OUTLET WORKS - SERVICE BRIDGE</u></p> <p>a. Super Structure</p> <ul style="list-style-type: none"> Bearings Anchor Bolts Bridge Seat Longitudinal Members Under Side of Deck Secondary Bracing Deck Drainage System Railings Expansion Joints Paint <p>b. Abutment and Piers</p> <ul style="list-style-type: none"> General Condition of Concrete Alignment of Abutment Approach to Bridge Condition of Seat and Backwall 	<p>Service bridge consists of three (3) seven (7) inch steel beams with wood decking. Wood Blocking is fastened to the inside web faces of the beams and wood Bracing Spans between this blocking</p> <p>The wood is badly weathered and rotted.</p> <p>A double horizontal steel rail is provided on each side. The rail is fastened to the wood deck with pipe flanges and screws.</p> <p>Due to the rotted wood and missing screws, these rails are loose and unsafe.</p>

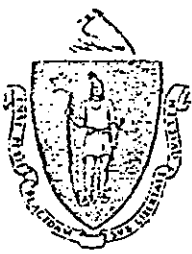
APPENDIX B

1. LIST OF DESIGN, CONSTRUCTION AND MAINTENANCE RECORDS
2. PAST INSPECTION REPORTS
3. PLANS AND DETAILS

LIST OF AVAILABLE ENGINEERING DATA

- 1) A plan showing plan and typical sections of dam and spillway was the only engineering data found.

Location: City of Northampton, Board of Public Works,
Water division. 237 Prospect Street, Northampton,
Massachusetts.



The Commonwealth of Massachusetts

EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL QUALITY ENGR.
DIVISION OF WATERWAYS

City of Northampton
Board of Public Works
Water Division
237 Prospect Street
Northampton, Massachusetts

100 Nashua Street, Boston 02114

February 25, 1977

Attention: Mr. Leon Murry

Re: Insp. Dam #2-6-337-2
Northampton's West Whatley
Reservoir Lower Dam

Dear Sir:

On 5-26-76, an Engineer from the Massachusetts Department of Public Works made a visual inspection of the above dam. Our records indicate the owner to be City of Northampton. If this information is incorrect will you please notify this office.

The inspection was made in accordance with the provisions of Chapter 253 of the Massachusetts General Laws as amended (Dams Safety Act). Chapter 706 of the Acts of 1975 transferred the jurisdiction of the so-called "Dams Safety Program" to the Commissioner of the Department of Environmental Quality Engineering.

The results of the inspection indicate that this dam is safe; however, the following conditions were noted that require attention: The condition of the floor of the overflow spillway channel has deteriorated further since last inspection. As noted in item #9, comments, the worst area is only 9+ downstream from crest of spillway. A continuous break-up of floor in this area could rapidly spread back to base of spillway crest section which would be structurally weakened by such action. The Division therefore considers this continuous deterioration of spillway channel floor a hazard to safety of dam and recommends that owners be requested to make proper repairs.

Heavy seepage noted.

We call these conditions to your attention before they become serious and more expensive to correct. With any correspondence please include the number of the Dam as indicated above.

Very truly yours,

John J. Hannon, P.E.
Chief Engineer

AMc:

cc: Francis J. Hoey
Russell Salls

INSPECTION REPORT - DAMS AND RESERVOIRS

1.

LOCATION:

City/Town WHATELY County Franklin Dam No. 2-6-337-2

Name of Dam Northampton's West Whately Reservoir - Lower

Topo Sheet No. 11A Mass. Rect. Coordinates: N 526,000, E 280,300

Inspected by: Harold T. Shumway, On May 26, 1976 Date 11/29/73 Last Inspection

2.

OWNER/S: As of May 26, 1976

per: Assessors _____, Reg. of Deeds _____, Prev. Insp. X, Per. Contact X

1. City of Northampton, Bd. of Public Works-Water Div. 237 Prospect St. Northampton
Name St. & No. City/Town State Tel. No.

2. _____
Name St. & No. City/Town State Tel. No.

3. _____
Name St. & No. City/Town State Tel. No.

3.

CARETAKER: (if any) e.g. superintendent, plant manager, appointed by
absentee owner, appointed by multi owners.
Mr. Leon Murray
Supt. of Water Division 237 Prospect Street, Northampton, Mass.

Name St. & No. City/Town State Tel. No.

4.

DATA:

No. of Pictures Taken None Sketches See description of Dam.
Plans, Where In office files of Northampton R.P.W. - Water Div.

5.

DEGREE OF HAZARD: (if dam should fail completely)*

1. Minor _____ 3. Severe X

2. Moderate _____ 4. Disastrous _____

Approx. 24 million gallons impoundment - several homes and highway
Comments: bridges downstream could be affected.

*This rating may change as land use changes (future development).

OUTLETS: OUTLET CONTROLS AND DRAWDOWN

No. 1 Location and Type: Westerly end of dam - 50' w x 5' h overflow spillway
with stone and conc. paved floor.

Controls None, TYPE: _____

Automatic _____. Manual _____. Operative Yes _____, No _____.

Comments: Several areas of spillway floor badly cracked and broken up.

No. 2 Location and Type: At gate house - 30" dia. C.I. drawdown conduit.

Controls Yes, Type: Gate Valve

Automatic _____. Manual X. Operative Yes X, No _____.

Comments: Valve works per water division personnel - minor brush growth in crevices of gatehouse foundation.

No. 3 Location and Type: At gate house intake well - 20" dia. C.I. intake main.

Controls Yes, Type: Gate valve - screw lift.

Automatic _____. Manual X. Operative Yes X, No _____.

Comments: Operable per water division personnel

Drawdown present Yes X, No _____. Operative Yes X, No _____.

Comments: See No. 2 above

7. DAM UPSTREAM FACE: Slope 2:1, Depth Water at Dam 10'±.

Material: Turf X. Brush & Trees _____. Rock fill _____. Masonry _____. Wood _____.

Other Stone riprapped

Condition: 1. Good X. 3. Major Repairs _____.

2. Minor Repairs _____. 4. Urgent Repairs _____.

Comments: Stone riprap paving appears stable - turf cover on upper portion of slope and along top of dam is good.

8. DAM DOWNSTREAM FACE: Slope 1½:1.

Material: Turf X. Brush & Trees _____. Rock Fill _____. Masonry _____. Wood _____.

Other _____

Condition: 1. Good _____. 3. Major Repairs _____.

2. Minor Repairs X. 4. Urgent Repairs _____.

Comments: Considerable seepage noted along toe of slope - some standing water noted on top of ground - minor brush growth.

3. EMERGENCY SPILLWAY: Available Yes. Needed _____.

Height Above Normal Water 0 Ft. varies according to water usage
Cut stone crest-conc. apron
Width 50 Ft. Height 5 Ft. Material paving downstream.

Condition: 1. Good _____ 3. Major Repairs _____
2. Minor Repairs X 4. Urgent Repairs _____

Comments: A hole 1' to 1½' deep, 10' + long and 5' + wide in spillway channel
floor, 9' + downstream from spillway crest on westerly side of channel.
other areas cracking and breaking up in floor.

10. WATER LEVEL AT TIME OF INSPECTION: 1/6 Ft. Above X. Below _____.

Top Dam _____ F.L. Principal Spillway X

Other _____

Normal Freeboard 5 Ft. to top dike.

11. SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment Minor brush growth on downstream slope.

Animal Burrows and Washouts None found

Damage to Slopes or Top of Dam None found

Cracked or Damaged Masonry Yes - overflow side channel spillway outlet floor
badly cracked and broken up.

Evidence of Seepage Yes, a considerable seepage flow was noted in seepage drains.

Evidence of Piping None found

Leaks None found

Erosion None found

Trash and/or Debris Impeding Flow None found

Clogged or Blocked Spillway None found

Other _____

(12.)

OVERALL CONDITION:

1. Safe_____.
2. Minor repairs needed_____ X_____.
3. Conditionally safe - major repairs needed_____.
4. Unsafe_____.
5. Reservoir impoundment no longer exists (explain)
Recommend removal from inspection list_____.

(13.)

REMARKS AND RECOMMENDATIONS: (Fully Explain)

Mr. Craig Nehring, work crew foreman of the Northampton Water Division, was present during inspection. While the seepage flows were considerable this seems to be a normal condition for this dam from past inspections. The condition of the floor of the overflow spillway channel has deteriorated further since last inspection. As noted in item #9, comments, the worst area is only 9'+ downstream from crest of spillway. A continuous break-up of floor in this area could rapidly spread back to base of spillway crest section which would be structurally weakened by such action. The District therefore considers this continuous deterioration of spillway channel floor a hazard to safety of dam and recommends that owners be requested to make proper repairs. At time of inspection the main dam structure appears to be safe.

INSPECTION REPORT - DAMS AND RESERVOIRS

LOCATION:

~~City~~/Town Whately County Franklin Dam No. 2-6-337-2

Name of Dam Northampton's West Whately Reservoir, Lower
Mass. Rect.

Topo Sheet No. 11A Coordinates: N 526,000, E 280,300

Inspected by: Harold T. Shumway, On Nov. 29, 1973. Date
Last Inspection 1970

(2.) OWNER/S: As of November, 1942

per: Assessors X, Reg. of Deeds _____, Prev. Insp. _____, Per. Contact X

City of Northampton,

1. Board of Public Works, Water Division, 237 Prospect Street, Northampton, Ma. 01060
Name St. & No. City/Town State Tel. No.

2. _____
Name St. & No. City/Town State Tel. No.

3. _____
Name St. & No. City/Town State Tel. No.

CARETAKER: (if any) e.g. superintendent, plant manager, appointed by
absentee owner, appointed by multi owners.

Mr. Leon Murray,

Superintendent of Water Division, 237 Prospect Street, Northampton, Ma. 01060
Name St. & No. City/Town State Tel. No.

DATA:

No. of Pictures Taken None Sketches See description of Dam.
Plans, Where In Northampton Water Department Office

(1.) DEGREE OF HAZARD: (if dam should fail completely)*

1. Minor _____ 3. Severe X

2. Moderate _____ 4. Disastrous _____

Comments: At least ten homes could be affected plus several bridges

*This rating may change as land use changes (future development).

2.) OUTLETS: OUTLET CONTROLS AND DRAWDOWN

50 ft. wide - 5 ft. high overflow spillway.

No. 1 Location and Type: Stone and concrete paved floor.

Controls No, TYPE: _____

Automatic _____. Manual _____. Operative Yes _____, No X _____.

Comments: Floor of spillway badly deteriorated - several areas of broken pavement

No. 2 Location and Type: 30" I.D., C.I. drawdown - conduit from gatehouse to brook
South of Williamsburg Road.

Controls Yes, Type: Gate

Automatic _____. Manual X _____. Operative Yes X _____, No _____.

Comments: Operated in 1970 - Leakage of water along pipe line evident

No. 3 Location and Type: 20" C.I. Intake Main - from gatehouse intake well

Controls Yes, Type: Gate valve - screw lift

Automatic _____. Manual X _____. Operative Yes X _____, No _____.

Comments: Verified by employee of Water Department

Drawdown present Yes X _____, No _____, Operative Yes X _____, No _____.

Comments: See No. 2 Above

3.) DAM UPSTREAM FACE: Slope 2:1 riprapped, Depth Water at Dam 6 $\frac{1}{2}$ '

Material: Turf X _____. Brush & Trees _____. Rock fill _____. Masonry _____. Wood _____.
Other Stone riprap.

Condition: 1. Good X _____.

3. Major Repairs _____.

2. Minor Repairs _____.

4. Urgent Repairs _____.

Comments: Stone riprap appeared stable - turf on top 5' of slope good.

3.) DAM DOWNSTREAM FACE: Slope 1 $\frac{1}{2}$:1

Material: Turf X _____. Brush & Trees _____. Rock Fill _____. Masonry _____. Wood _____.
Other _____

Condition: 1. Good X _____.

3. Major Repairs _____.

2. Minor Repairs _____.

4. Urgent Repairs _____.

Comments: Turf on slopes good - considerable wetness at toe of northeasterly
half of dike noted.

9. EMERGENCY SPILLWAY: Available X. Needed _____.

Height Above Normal Water 3 Ft. at time of inspection.

Width 50 Ft. Height 5 Ft. Material Cut stone crest;
concrete apron upstream;
conc. & stone paving down-
stream

Condition: 1. Good _____.

2. Minor Repairs _____.

3. Major Repairs X.

4. Urgent Repairs _____.

Comments: Several areas of downstream spillway floor broken up, large spalled area of floor at crest - downstream side.

10. WATER LEVEL AT TIME OF INSPECTION: 3 Ft. Above _____. Below X.

Top Dam _____ F.L. Principal Spillway _____.

Other Flow line of emergency spillway.

Normal Freeboard 8½ Ft. to top dike.

11. SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment Yes. Minor brush growth in spillway intake.

Animal Burrows and Washouts None found

Damage to Slopes or Top of Dam None found

Cracked or Damaged Masonry See notes on spillway floor

Evidence of Seepage Considerable wetness noted at toe of slope on downstream side of dike.

Evidence of Piping None found

Leaks Flow of water noted along side of waste pipe at outlet end - source unknown.

Erosion Erosion of spillway channel noted

Trash and/or Debris Impeding Flow None found

Clogged or Blocked Spillway None found

Other _____

- 4 -

(2.)

OVERALL CONDITION:

1. Safe_____.
2. Minor repairs needed X_____.
3. Conditionally safe - major repairs needed_____.
4. Unsafe_____.
5. Reservoir impoundment no longer exists (explain)
Recommend removal from inspection list_____.

(13.)

REMARKS AND RECOMMENDATIONS: (Fully Explain)

The grade and alignment of earthen dam appeared good. The upstream slope was stone riprapped with turfed surface at top 5 feet of slope, all of which appeared stable. The downstream slope is well turfed over but considerable wetness of ground was noted at toe of slope on northeasterly part of dike. There is a drainage ditch and catch basin drain at lower end of this area to carry off water. This condition has existed for some years according to Northampton Water Department employee and it appears to be stabilized.

The emergency spillway at westerly end of dam is in poor condition. Some brush and considerable silt is partially blocking upstream entrance. The crest of spillway is made of cut stone blocks and is sound. Immediately below crest is a large section of badly spalled concrete paved floor. At start of spillway drop-off (see sketch) there are several areas of broken floor pavement with eroding holes beneath. The entire length of the rest of stone and concrete paved floor of spillway is deteriorating badly.

The District believes this condition should be corrected to prevent eventual weakening of crest wall and then dam itself.

RCS/js /sd

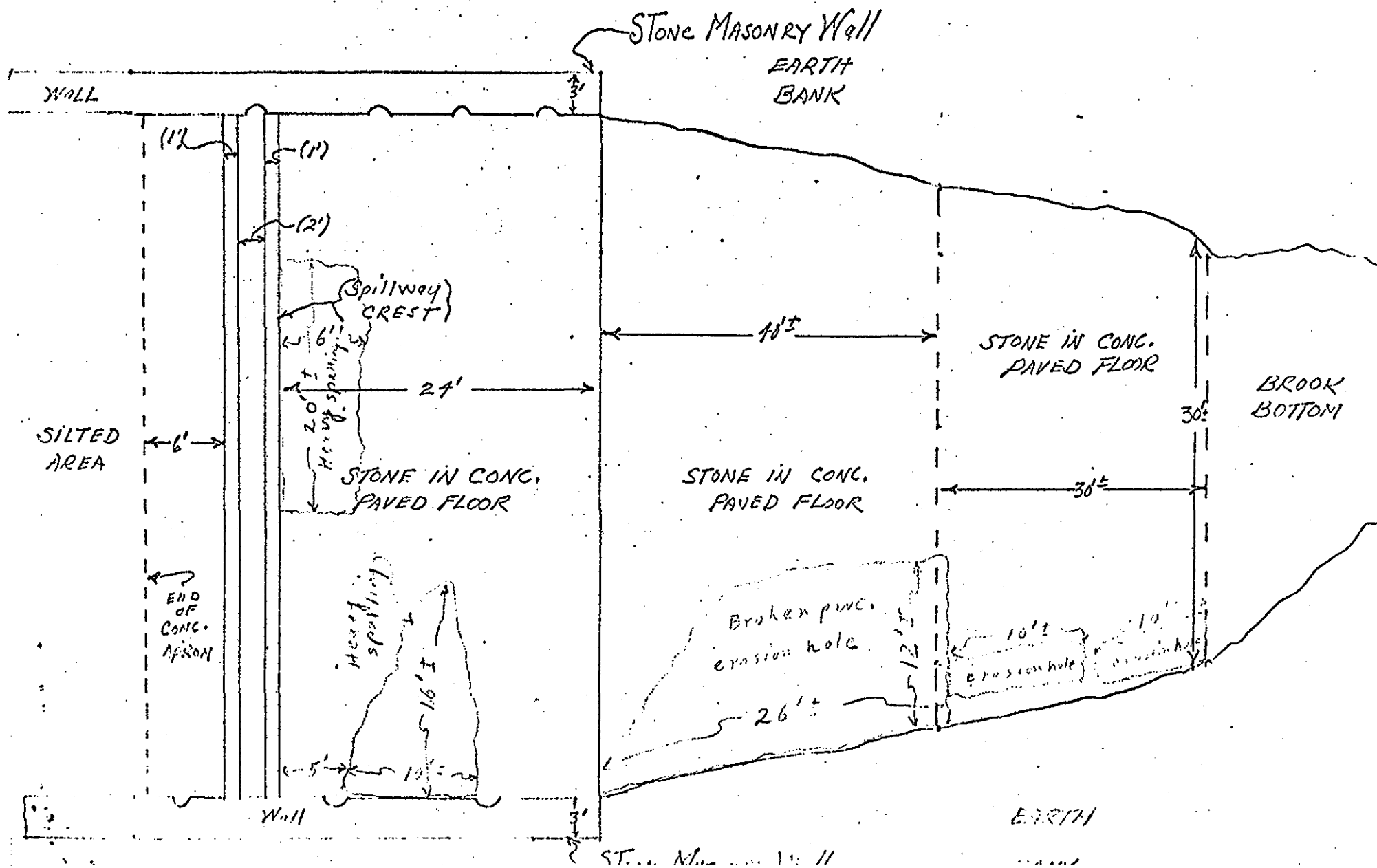
Attachment

Sheet 2 of 4 Sheets

Northampton's West Whately Reservoir Lower
—Whately, Mass.—

Doc No 2-6-337-2

ATTACHMENT TO
Nov. 29, 1973 INSPECTION REPORT



January 18, 1970

Leon Murray, Superintendent
Board of Public Works
Water Division
237 Prospect Street
Northampton, Massachusetts 01060

Re: Inspection-Dam # 2-6-337-2
Whately
West Whately Lower Reservoir Dam

Dear Mr. Murry,

An engineer from the Massachusetts Department of Public Works has inspected the above dam, owned by the City of Northampton.

The inspection was made in accordance with Chapter 253 of the Massachusetts General Laws, as amended by Chapter 595 of the Acts of 1970.

The results of the inspection indicate that this dam is safe; however, the emergency spillway at the westerly end of the dam is in poor condition. Some brush and silt is partially blocking the upstream entrance. Below the spillway crest a large section of the concrete floor is spalled. Several other floor areas have broken pavement with eroded holes beneath. The entire length of the stone and concrete floor is deteriorated. This spillway area should be repaired to prevent the weakening of the crest wall and the dam itself.

We call these conditions to your attention now, before they become serious and more expensive to correct.

Very truly yours,

F. C. Schwehn

FRED. C. SCHWEHN, P.E.
Deputy Chief Engineer

LRA
LRA:may
cc: F.J. Hoag
R. Salls

TOWN WHATELYName Northampton Reservoir #1Inspection Date 1970Owner City of NorthamptonLocation just west of West HawleyType of Pond madeAcreage about 10 acres

Drainage Area _____

Comments _____

Type of Dam earth, with a ⁷stone masonry core wallLength 20 feetHeight 15 feet

Head of Water _____

Comments _____

Type of Spillway stone masonry on ledge, bridge over spillway

Width _____

Height _____

Comments _____

Condition, Previous Report, Dated 1968 This dam is safe

Present Condition

Submitted by Harold T. Shumway Dam No. 2-6-337-2
Date November 29, 1973 City/Town Whately
Name of Dam Northampton's West Whately
Reservoir - Lower

1. Location: Topo Sheet No. 11A Mass. Rect. Coordinates N 526,000 E 280,300

Provide $8\frac{1}{2}$ " x 11" in clear copy of topo map with location of Dam clearly indicated.

On West Brook in West Whately about 100 feet north of intersection of
Conway Road and Williamsburg Road.

2. Year built 1902 - 1903 Year/s of subsequent repairs In 1930's
Reservoir cleaned

3. Purpose of Dam: Water Supply X Recreational _____
Flood Control _____ Irrigation _____ Other _____

4. Drainage Area: $8\frac{1}{4}$ sq. mi. _____ acres.
Type: City, Bus. & Ind. _____ Dense Res. _____ Suburban _____ Rural, Farm _____
Wood & Scrub Land X Slope: Steep 50% Med. 50% Slight _____

5. Normal Ponding Area: 6 Acres; Ave. Depth 12' to 13'
Impoundment: 24 Million gals.; 75± acre ft.
Silted in: Yes X No _____ Approx. Amount Storage Area 15%±

6. No. and type of dwellings located adjacent to pond or reservoir _____
i.e. summer homes etc. None

7. Dimensions of Dam: Length 1200'± Max. Height 23½'
Embankment 1125' long Freeboard 5'
Slopes: Upstream Face 2:1 riprapped
Downstream Face 1½ to 1 loamed
Width across top 8' to 12'

Dam No. 2-8-337-2

Classification of Dam by Material:

Earth X Conc. Masonry _____ Stone Masonry _____

Timber _____ Rockfill _____ Other Stone paved slope upstream :
of dike

3A.

Dam Type: Gravity X Straight X Curved, Arched _____ Other Curved nor
Overflow _____ Non-overflow _____ easterly e:

9.

A. Description of present land usage downstream of dam:

100 % rural; _____ % urban

B. Is there a storage area or flood plain downstream of dam which
could accommodate the impoundment in the event of a complete
dam failure? Yes _____ No X

C. Character Downstream Valley: Narrow X Wide _____ Developed Rural homes
Rural 100% Urban _____

10.

Risk to life and property in event of complete failure.

No. of people 10

No. of homes 10

No. of businesses None

No. of industries None Type _____

No. of utilities 3 Type Water, telephone and electric
transmission lines

Railroads None

E. S. Crafts Dam, Number 2-6-337-1, plus remains of four dams
Other dams now breached.

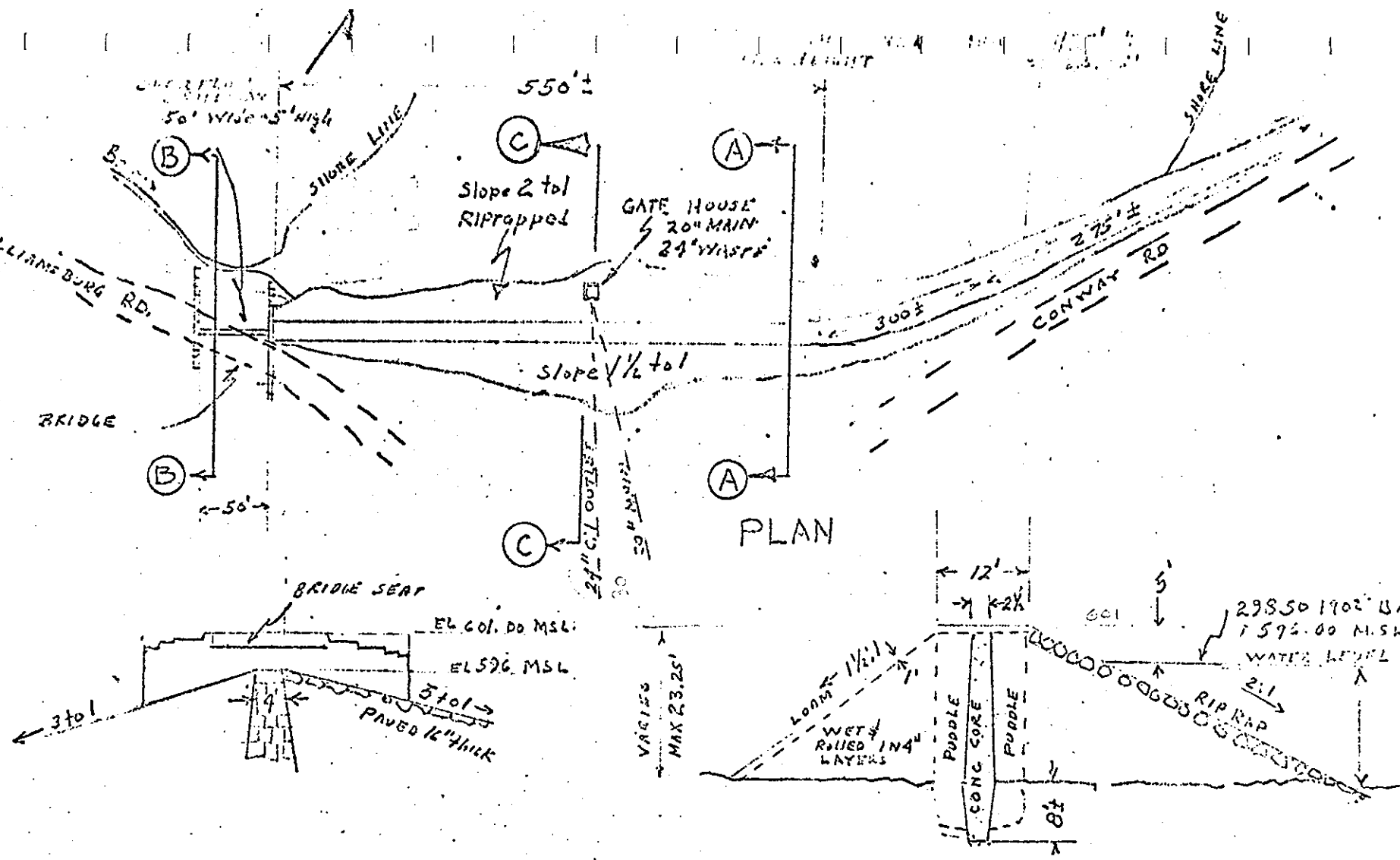
Other Five Town Highway Bridges and three Town Highways

11.

Attach Sketch of dam to this form showing section and plan on 8 $\frac{1}{2}$ " x 11" sheet.

RCS/vk/sd
Attachments
Locus Plan
Sketches

NOT WHATEVER LOWER DAM
 OLD RESERVOIR
 SKETCHING NOT TO
 SCALE



XX SECTION "BB"

XX SECTION "AA"

S. K. Ich.

No. 1 scale

Sheet 2 of 4 Sheets

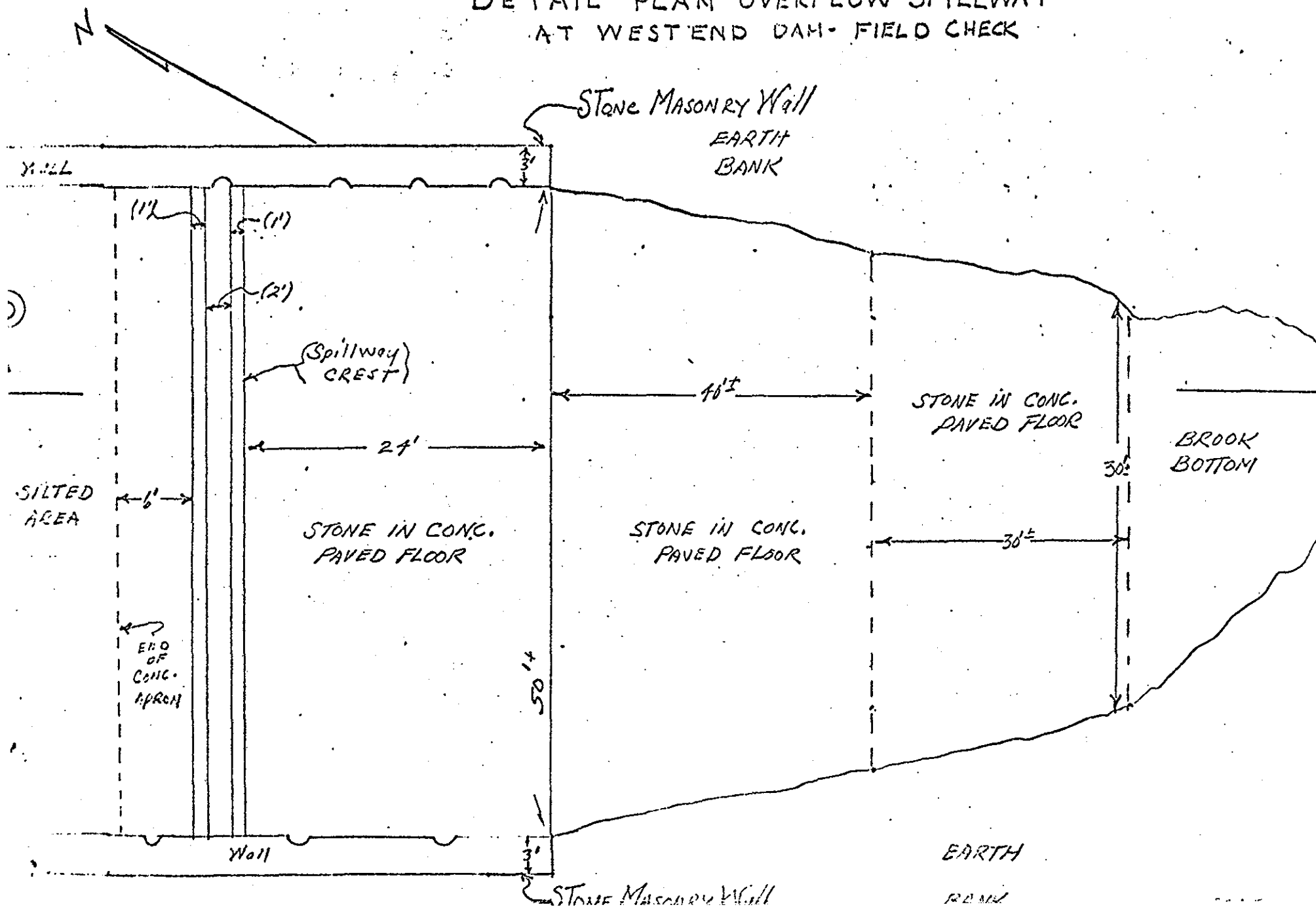
Northampton's West Watch, West Choir Lower

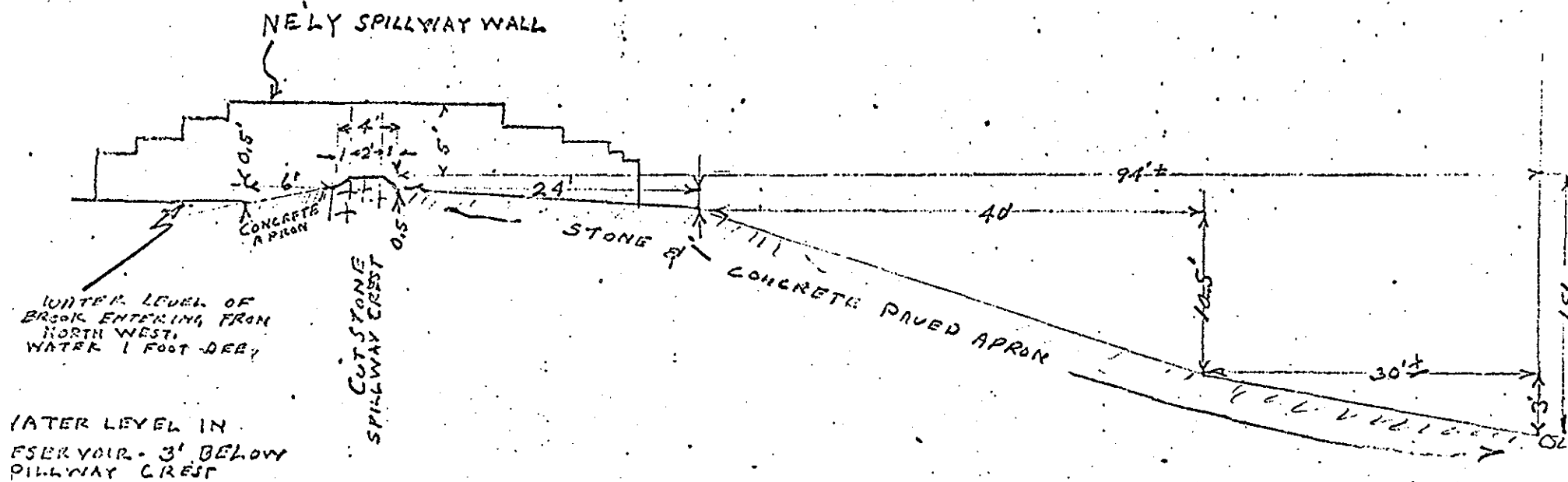
WHALEY, MASS.

DAM No. 2-6-337-2

DETAIL PLAN OVERFLOW SPILLWAY

AT WEST END DAM- FIELD CHECK





X SECTION DD

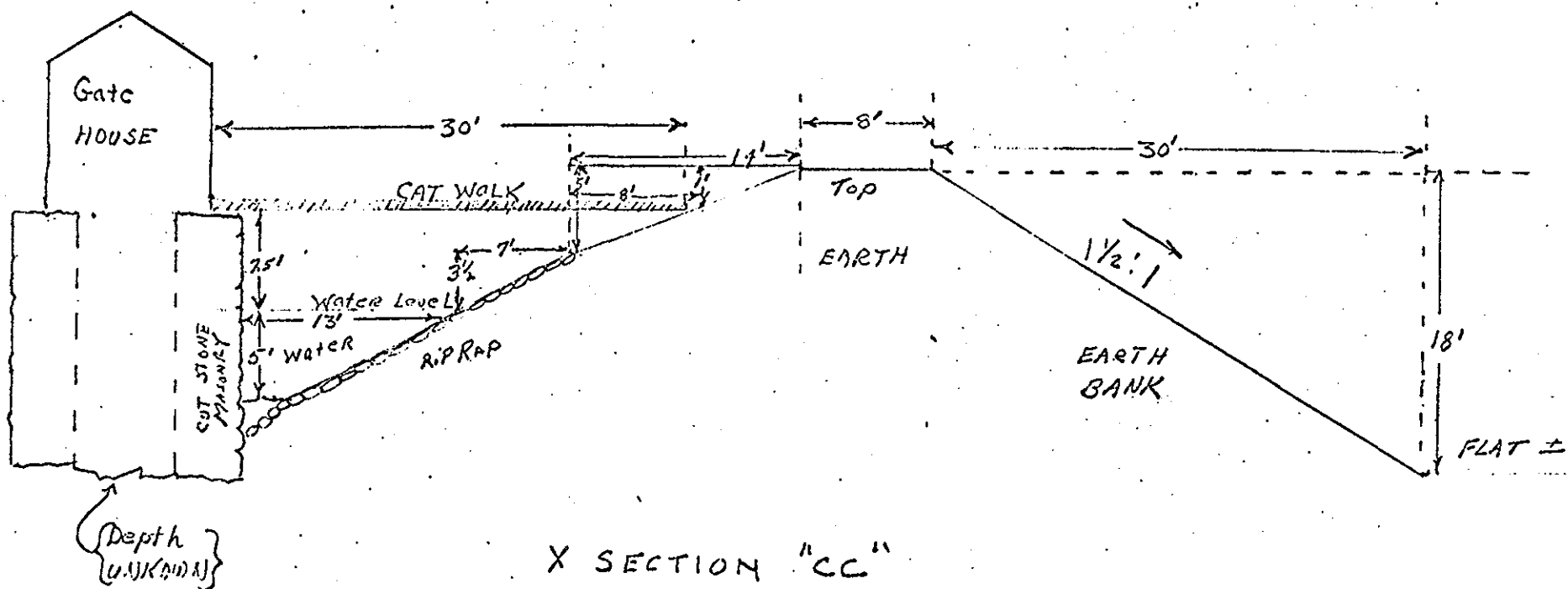
X SECTION THROUGH OVERFLOW SPILLWAY FROM
FIELD CHECK NOV. 29, 1973

12/3/73
0.7

DESIGN
 L. T. Sch...
 Sheet 4 of 1 Sheets

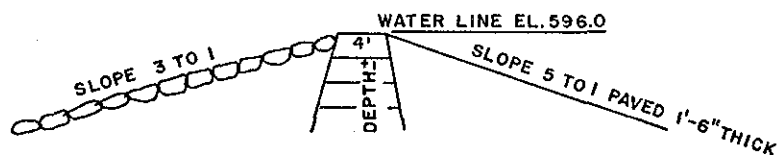
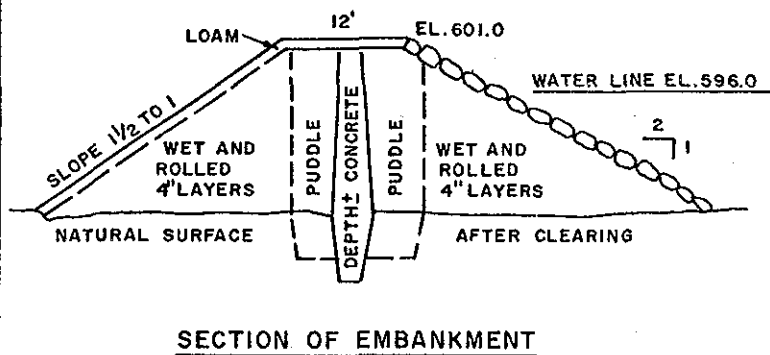
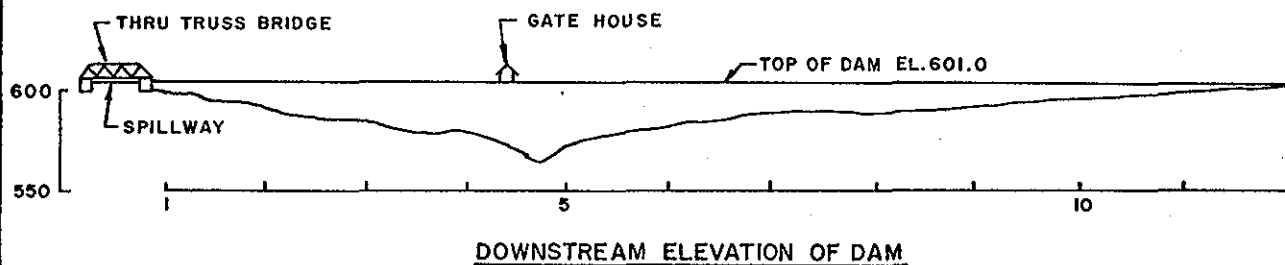
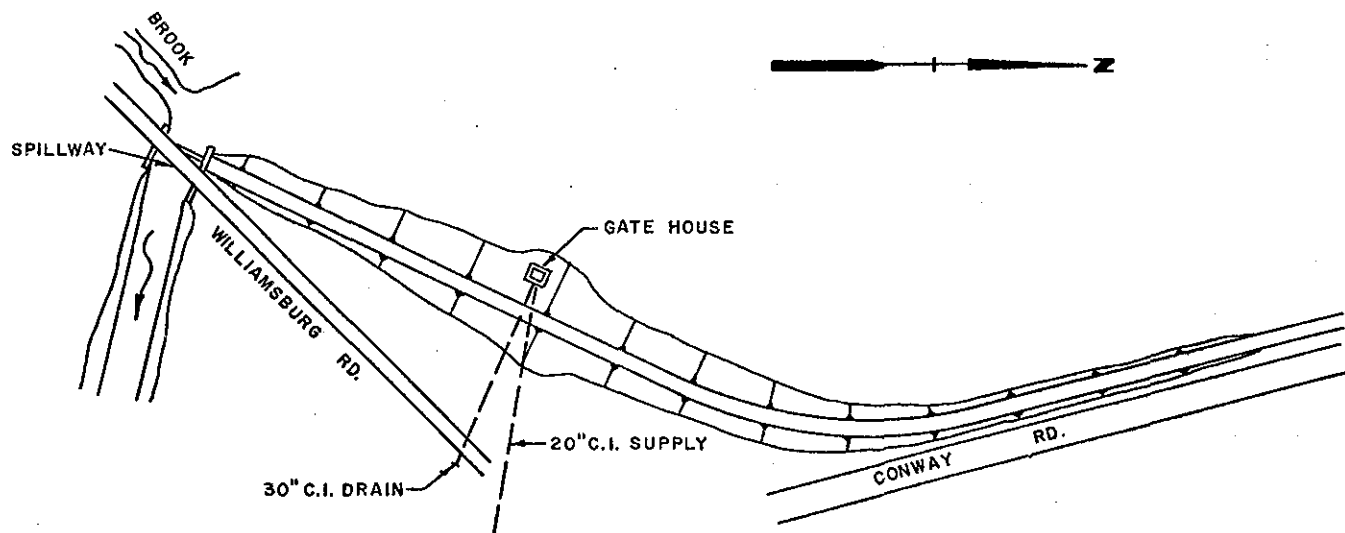
WCS...
 Wb...
 4/25

DATE...
 11/29/73



X SECTION "CC"
 X SECTION THROUGH ENBANKMENT
 AT GATE HOUSE - FROM FIELD
 CHECK 11/29/73



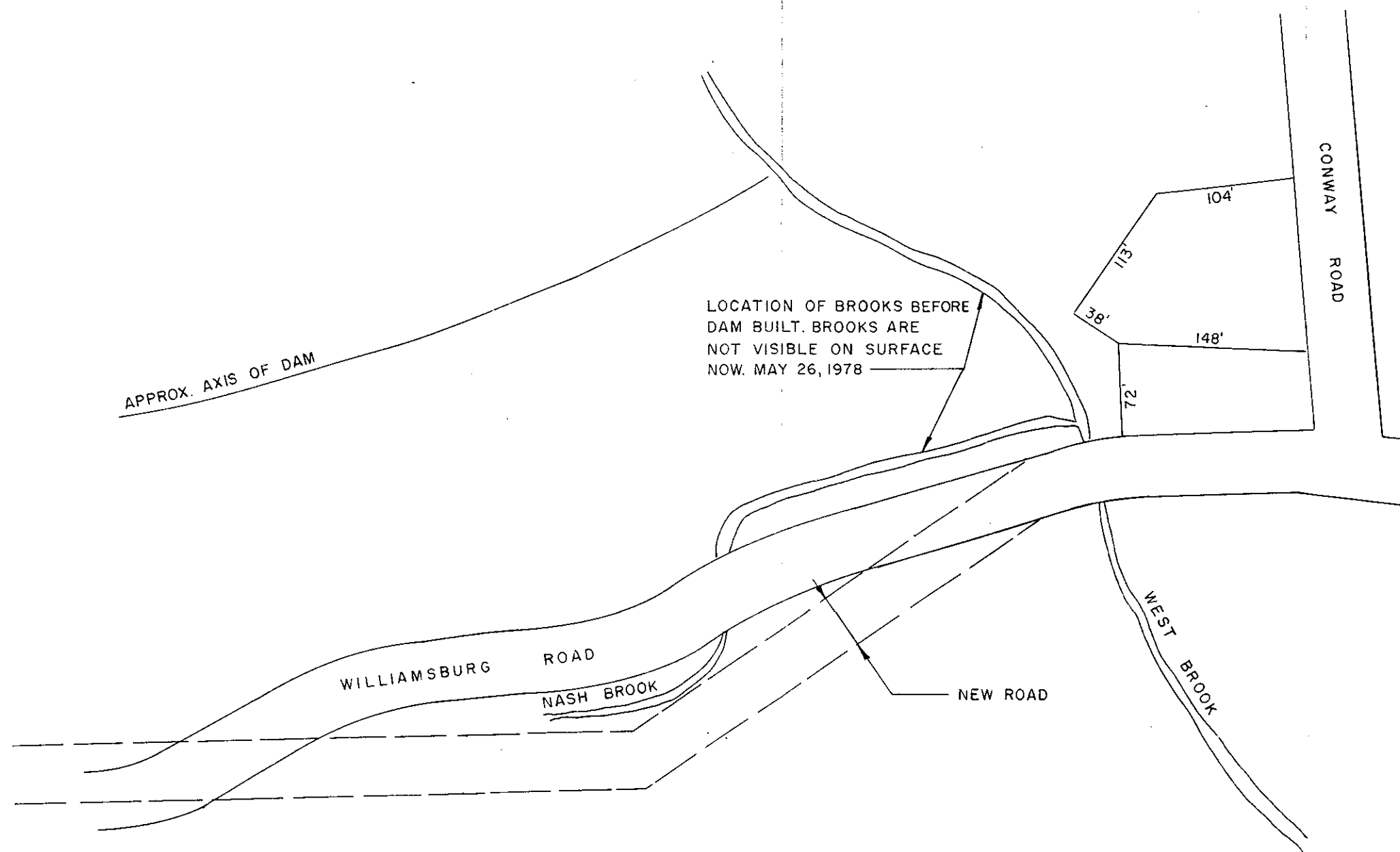


INFORMATION SHOWN COPIES
FROM PLAN DATED 1901

NORTHAMPTON RESERVOIR LOWER DAM IN WHATELY MA.

NOT TO SCALE

JULY 1978



NOTE:

SKETCH COPIED FROM NORTHAMPTON
WATER DEPT. DRAWING WHATELY
COMPLEX LOWER DAM AREA.

AREA PLAN OF
FORMER BROOKS

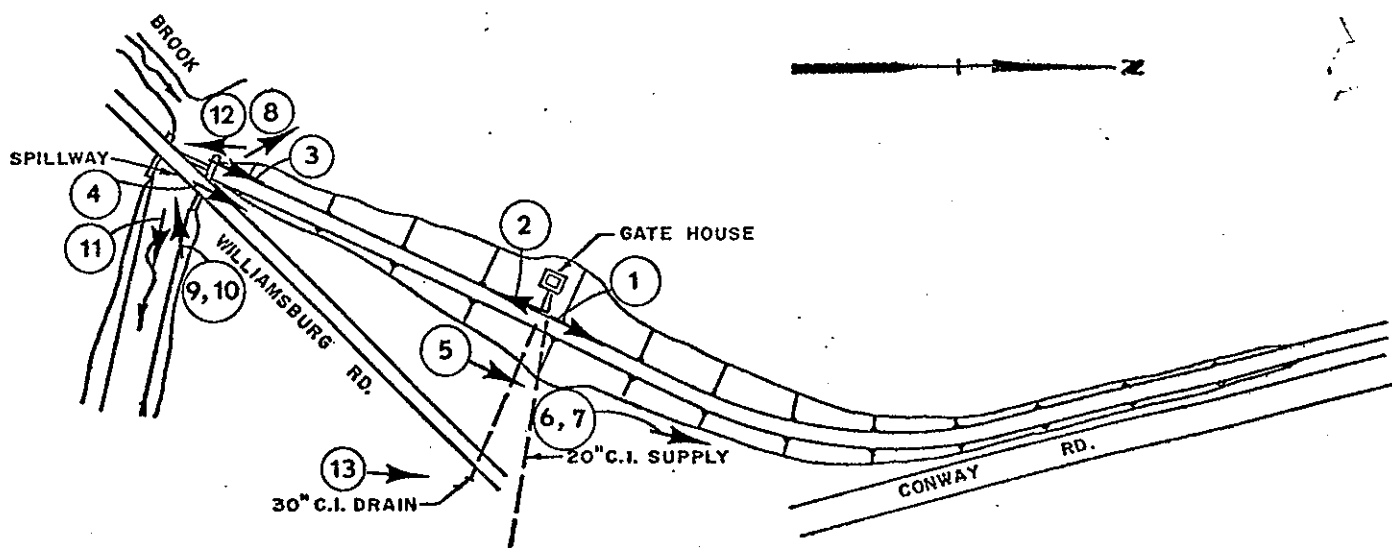
NORTHAMPTON RESERVOIR
LOWER DAM
IN
WHATELY, MA.

NOT TO SCALE

JULY 1978

APPENDIX C

PHOTOGRAPHS



PLAN

LOCATION OF PHOTOGRAPHS
NORTHAMPTON RESERVOIR
UPPER DAM
IN
WHATELY MA.

NOT TO SCALE JULY 1978



PHOTO NO. 1 - Upstream face from gate house to
left abutment.



PHOTO NO. 2 - Upstream face from gate house to
right abutment.



PHOTO NO. 3 - General view of dam from spillway
looking toward left abutment.



PHOTO NO. 4 - Downstream face showing proximity of
large trees to toe of dam. The nearest
tree is 13 ft. from toe of dam.



PHOTO NO. 5 - General view of seepage area at d.s. toe. Pipe in upper part of photo is opposite gate house in the center of the dam.



PHOTO NO. 6 - Seepage area near left abutment not visible in PHOTO 5.



PHOTO NO. 7 - Close-up
of seepage area shown in
PHOTO 6 .



PHOTO NO. 8 - General view of reservoir from right
abutment.



PHOTO NO. 9 - Spillway outlet channel.



PHOTO NO. 10 - Spillway outlet and bridge abutment.



PHOTO NO. 11 - General view of outlet channel
looking downstream.



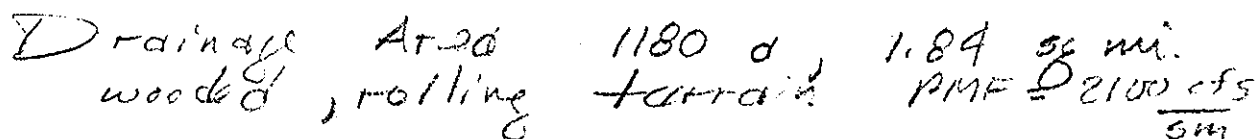
PHOTO NO. 12 - General
view of Spillway crest.



PHOTO NO. 13 - Outlet pipe below dam across
Williamsburg Rd.

APPENDIX D

1. HYDROLOGIC COMPUTATION
2. DRAINAGE AREA



spillway could handle runoff from lower area only if upper dam were low enough to contain entire $1\frac{1}{2}$ PMF runoff.

$$\begin{array}{r} 50 \\ 40 \\ \hline 90 \end{array}$$

$$\begin{array}{r} 50 \\ 40 \\ \hline 90 \end{array}$$

$$\begin{array}{r} 50 \\ 40 \\ \hline 90 \end{array}$$

18-11
2-23-78
A
BY FDO



HAYDEN, HARDING & BUCHANAN, INC.
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BOSTON, MASSACHUSETTS

SHEET NO. 1
JOB Draw Insp
SUBJECT Northampton
CLIENT Corps

Cont.

$$Q = 4144$$

gross γ $S \approx 0.001 \pm$ flat

$$L = 1200'$$

$$H: 1" = 200'$$

$$V: 1" = 4'$$

Spillway

let $Y = 1$

$$A = 1(1200) = 1200 \text{ sf}$$

$$WP = 1200 + 50 = 1250'$$

$$R = 0.96 \quad R^{2/3} = .973$$

$$V = \frac{1.486}{.04} (.973) (.0316) = 1.14 \text{ fps}$$

$$Q = VA = 1370 \text{ cfs} < 4144$$

let $Y = 2'$

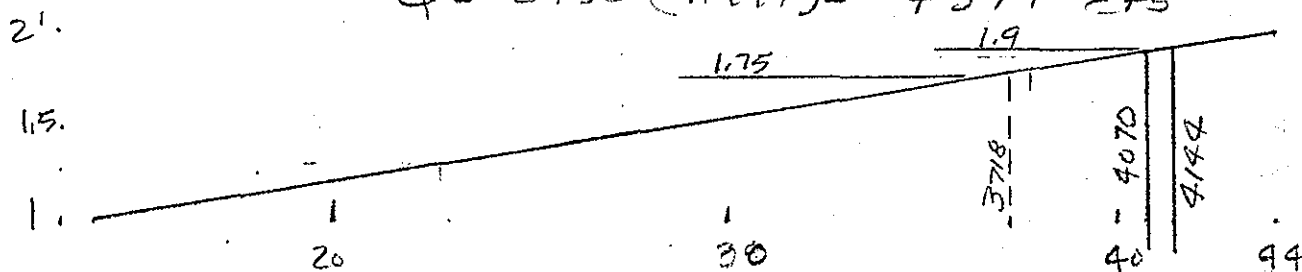
$$A = 2(1250) = 2450'$$

$$WP = 1300$$

$$R = 1.885 \quad R^{2/3} = 1.53$$

$$V = 37.15 (1.53) (.0316) = 1.794 \text{ fps}$$

$$Q = 2450 (1.794) = 4397 \text{ cfs}$$



$Y \approx 1.9'$ Elev. $602.9' \pm \approx 603$
bridge over dam would
be "washed-out"!

"reduction of upper flow from 4250 to 3715
does not cause significant change - leave
" " " EL. 602.75

NO. 18-117
6-23-75
MA
 BY FDD



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 CONSULTING ENGINEERS
 BOSTON, MASSACHUSETTS

SHEET NO. 4

JOB Dam Survey
 SUBJECT Norfolk Dampton - L.
 CLIENT Camp

Water will flow over dam about
 2' deep. Dam is "low" earth
 & stone construction - does not
 seem likely to fail due to
 this flood.

check

Dam width at mid height $\approx 800'$
 mid height elev $\approx 595'$

$$Q_{P1} = 6182 \text{ cfs}$$

$$Sten_1 = 77.28 \text{ af} \times 12 \div 1180 + 2897 = 0.23 \text{ in.}$$

$$Q_{P2} = 6182 \times \left(1 - \frac{1012 \times 0.23}{19}\right) = 6108 \text{ cfs}$$

$$Sten_2 = 76.2 \text{ af}$$

$$\text{ave } Sten = (77.28 + 76.2) \div 2 = 76.74 \text{ af}$$

$$Q_{P3} \approx 6,148 \text{ cfs}$$

$$Q_{PF} = \frac{8}{27} (320') \sqrt[5.67]{32.2 \cdot (25')^{12.5}}^{3/2} = 67,200 \pm \text{cfs}$$

ELEV 562 \pm

JOB NO. 75-114
 DATE 6-78
 Y 11
 H'D BY FDD

HH & B HAYDEN, HARDING & BUCHANAN, INC.
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 BOSTON, MASSACHUSETTS

SHEET NO. 5-
 JOB Dam Fugate
 SUBJECT Northampton
 CLIENT C. J. Co.

$Q_{reg} = 67,200 \text{ cfs}$

300

elev 595 $S = 5' \times 105''$

$WP = 140 + 160 = 300$

$A = 14.5(100) + \frac{390}{2} \times 15 = 2550 + 1450 = 4000$

$R = 13.33 \quad 5.67$

$V = 12.38 \cdot (5.67) \cdot (.223) = 15.65 \text{ fps}$

$Q = 62,632 < 67.2 \text{ NG}$

$n =$ 0.12 flood plain
 trees, weeds,
 not developed

$A = 1(320) = 320 + 4000 = 4320$

$Q = 4320 (15.65) = 67608 \quad \text{OK}$

elev = 596

elev 590

$WP = 290$

$A = 4000 - 18(50) = 3100$

$R = 10.68 \quad 4.89$

$V = 13.5$

$Q = 41859$

elev \approx 591

$A = 3300$

$V \approx 14$

$Q = 46,200$

stream bed 580.
 church, 2 bldg

JOI NO. 72.10
DATE 6/27
BY MA
CH BY FDD



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BOSTON, MASSACHUSETTS

SHEET NO. 6
JOB Dam Inspect
SUBJECT Northampton - L
CLIENT Corps

600

$$\begin{aligned} \text{elev} &= 590 & S &= 0.033 \\ \text{wp} &= 350' \\ A &= 35(100) = 3500 \text{ sf} \\ R &= 10' \quad 4.67' \\ V &= 12.38(4.67)(0.181) = 10.5' \\ Q &= 36759 \text{ cfs} < 44352 & 7593 \end{aligned}$$

$$\begin{aligned} \text{elev} &= 592 \\ \text{wp} &= 380 \\ A &= 3500 + 2(39)(10) = 4280 \\ R &= 11.26' \quad 5.06' \\ V &= 11.33' \\ Q &= 48528 > 44352 & 4173 \end{aligned}$$

$$\text{Elev} \approx 591.25 \pm$$

JL NO. 70-117
 DATE 6-7-73
 BY MA
 C D BY FDD



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SHEET NO. 7-
 JOB Dam - Fudge
 SUBJECT Northampton -
 CLIENT Co. 1st Regt

8000'

35K

elw 580

$S = .05''$

Dtm Str. 560

$WP = 150$

$A = 1650$

$R = 11.5'$

$V = \frac{1,486}{.12} (4.98)(.224) = 13.79'$

$Q = 22,747;$

elw 585

$WP = 150 + 30 = 180'$

$A = 1650 + 15(50) = 2400$

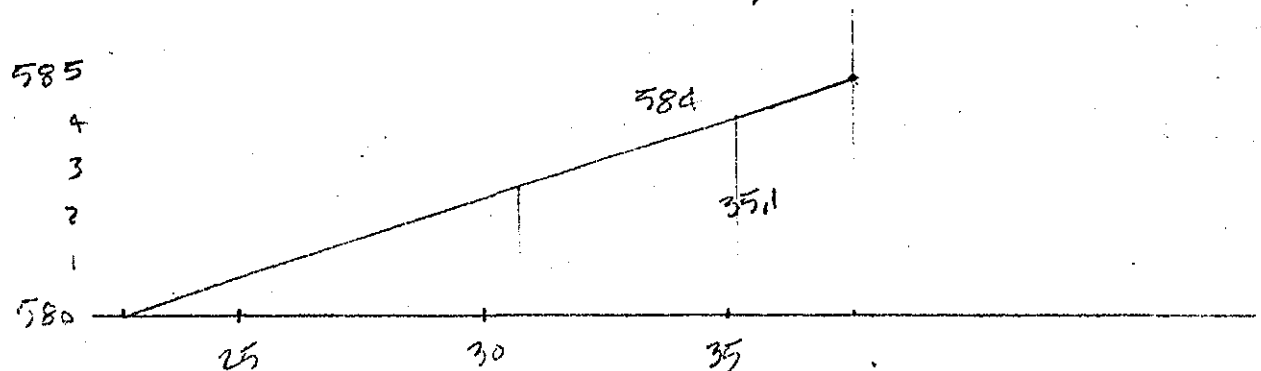
$R = 13.33' \quad 5.67'$

$V = 15.66 \text{ fps}$

$Q = 37,579 \text{ cfs}$

(2 structure!)

no structure for next 6000'
 then 8 @ 6000' to 8000' along
 stream bed appear 4 → 5
 could have major damage
 possible loss of life
 homes are w/in 50'± of stream
 channel is not deep here.



NO 78.117
 E 6/28
 M/L
 B FDD



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 BOSTON, MASSACHUSETTS

SHEET NO. 8
 JOB Dams
 SUBJECT Northampton Lower
 CLIENT Corps

Storage at failure 121 d-f

$$Q_{P_1} = 67,200 \text{ cfs in}$$

$$A_1 = 8' \times \left(\frac{800 + 1200}{2} \right) = 8400$$

$$A_2 = 4000$$

$$\text{Sta } 3+00 \text{ Elev } 593.25 \pm$$

$$Vol = \frac{300(6200)}{43560} = 4.3 \text{ d-f}$$

$$Q_{P_2} = 67,200 \left(1 - \frac{4.3}{121} \right) = 43,344 \text{ cfs}$$

$$\text{elev } 590.5 \quad A \approx 3200 \text{ sf}$$

$$Vol = 300 \left(\frac{8800 + 3200}{2} \right) \div 43560 = 4.1 \text{ d-f}$$

$$Q_{P_2} = 67200 \left(1 - \frac{4.1}{121} \right) = 44,352 \text{ cfs out}$$

$$\text{Sta } 6+00 \text{ Elev. } 591.25 \quad A = 4000$$

$$Q_{P_2} = 44352 \left(1 - \frac{2.5}{121} \right) = 35,260 \text{ cfs}$$

$$Vol = 300 \left(\frac{4000 + 3200}{2} \right) \div 43560 = 2.5 \text{ d-f}$$

$$\text{elev } 589.5 \quad A \approx 3360$$

$$V = \frac{3360 + 4000}{2} \times \frac{300}{43560} = 25.34$$

$$Q_{P_2} = 44352 \left(1 - \frac{2.5}{121} \right) = 35,127 \text{ cfs out}$$

JO NO. 78-117
DATE 6/25
BY MA
CH BY FDD



HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

SHEET NO. 9
JOB Dams
SUBJECT Northampton - 1
CLIENT Corps

Sta 8+00

$$Q_{in} = 35,127 \quad \text{elev } 584. \pm \quad A = 2250$$

$$V = 200 \times \left(\frac{2250 + 4200}{2} \right) \div 43560 = 14.8 \text{ cfs}$$

$$Q_{P2} = 35127 \left(1 - \frac{14.8}{121} \right) = 30,841 \text{ cfs}$$

$$\text{elev } 582.75 \quad A = 2100$$

$$V = 200 \left(\frac{2100 + 4200}{2} \right) \div 43560 = 14.5 \text{ cfs}$$

$$V_a = 14.65 \text{ cfs}$$

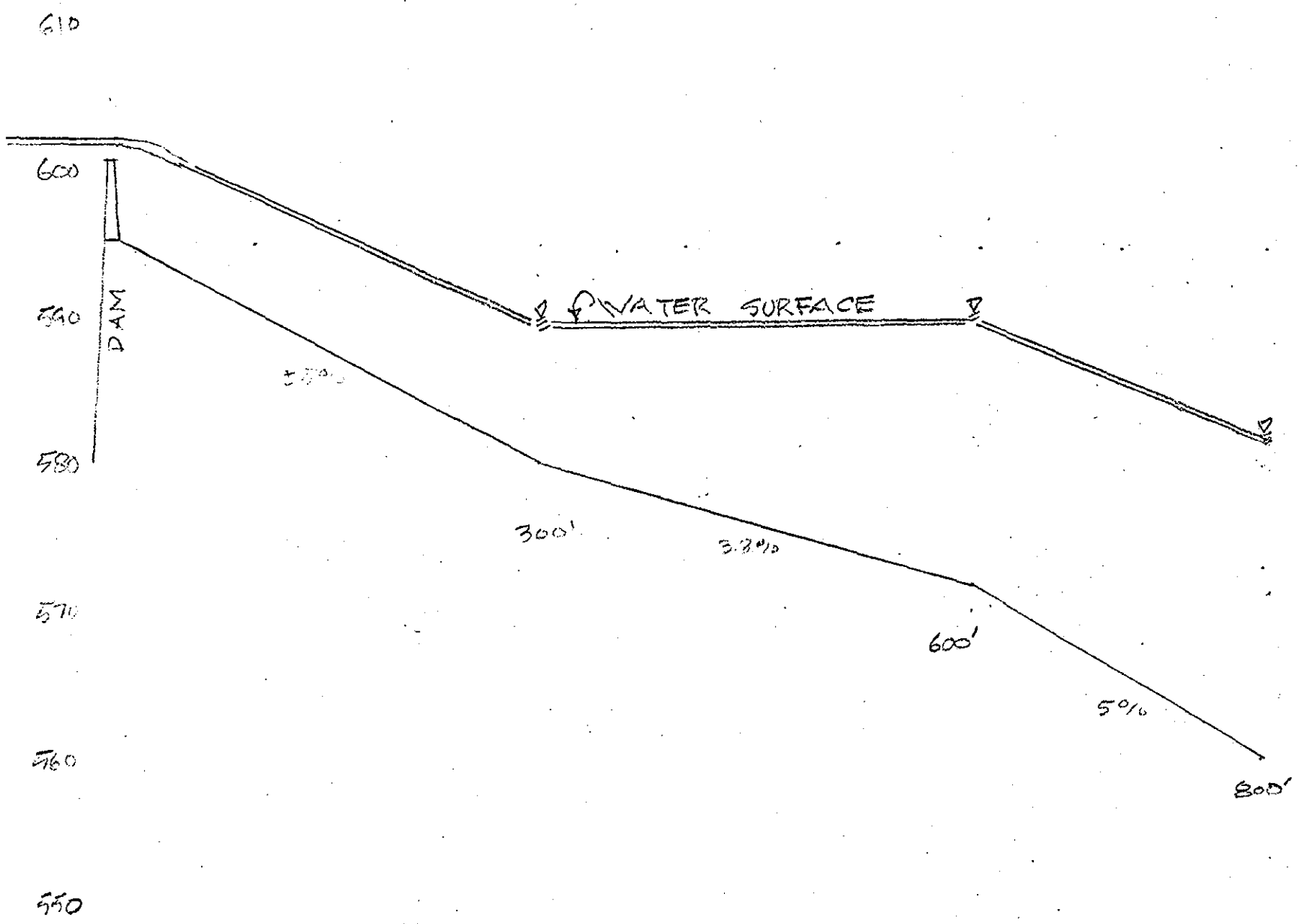
$$Q_{P2} = 35127 \left(1 - \frac{14.65}{121} \right) = 30,876 \text{ cfs } \underline{\text{out}}$$

NO. 6-23
 Vm 4
 BY



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SHEET NO. 1
 JOB Dam Design
 SUBJECT Northampton Co. Lands
 CLIENT Corps



VLD

o. 78-1:7
 -6-23
 MA
 BY FDB



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 BOSTON, MASSACHUSETTS

SHEET NO. 11

JOB Ddm Tug.
 SUBJECT Northampton - Low 21
 CLIENT Corps

<u>Elev</u>	<u>Sgin</u>	<u>a</u>	<u>a_{ave}</u>	<u>Depth</u>	<u>A-F</u>	<u>A-F_{accum}</u>
590	.04	3.7	—	—	—	—
596	.11	10.2	7	6	42	42
600	.13	12.	11.1	4	44.4	86.4
601		12.2	12.1	1	12.2	98.6
602.8		12.53	12.37	1.8	22.3	120.9
604		13	12.77	1.2	15.32	136.2
605.5		13.2	13.1	1.5	19.7	155.9
610	.15	13.9	13.55	4.5	61	216.9



SHEET NO. 12

JOB Demo Image
SUBJECT Northampton - 6
CLIENT Corps

Store Dis-Store Circle

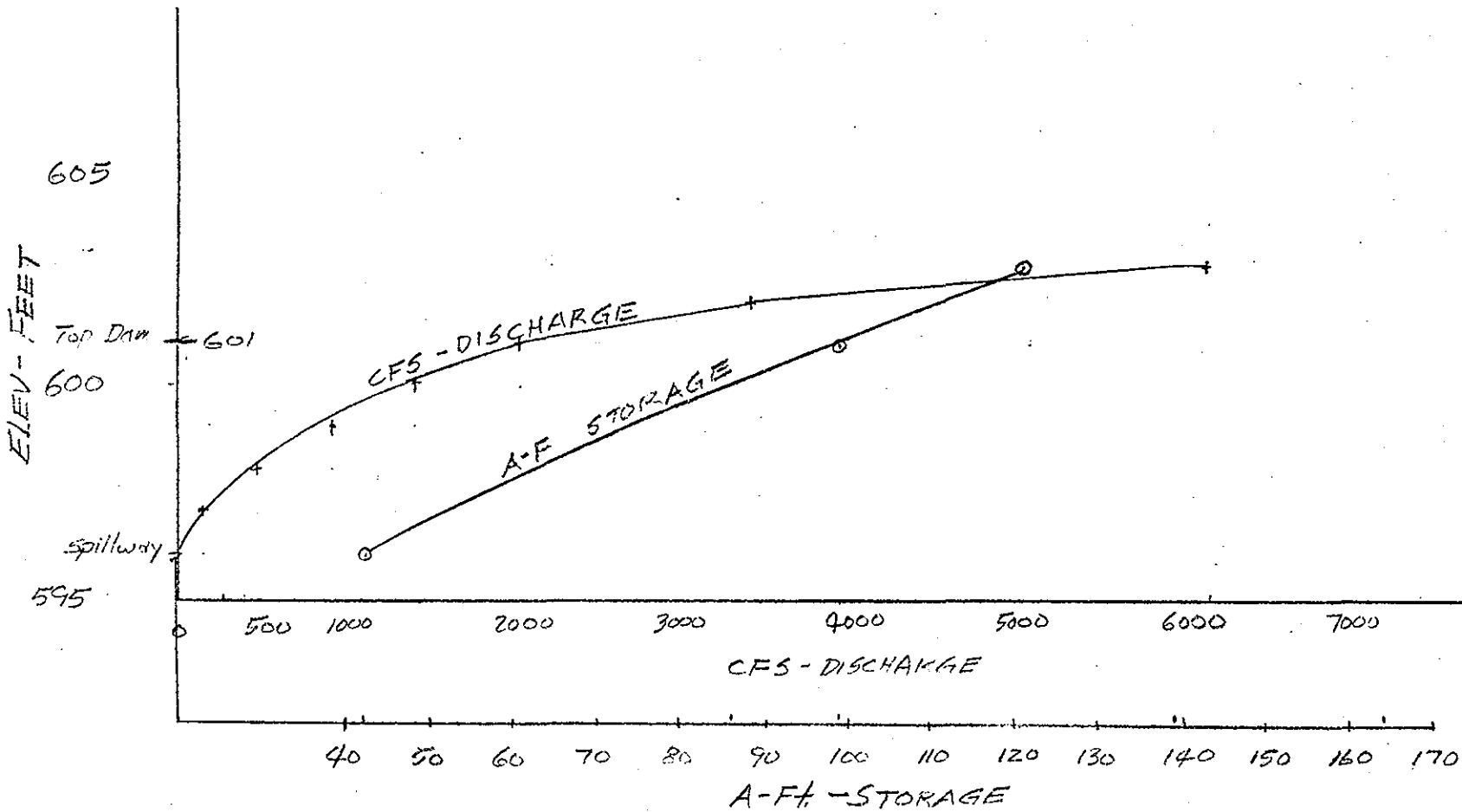
$$\phi = \frac{VA}{V} = \frac{1.486}{.015} R^{2/3} G^{1/2}$$

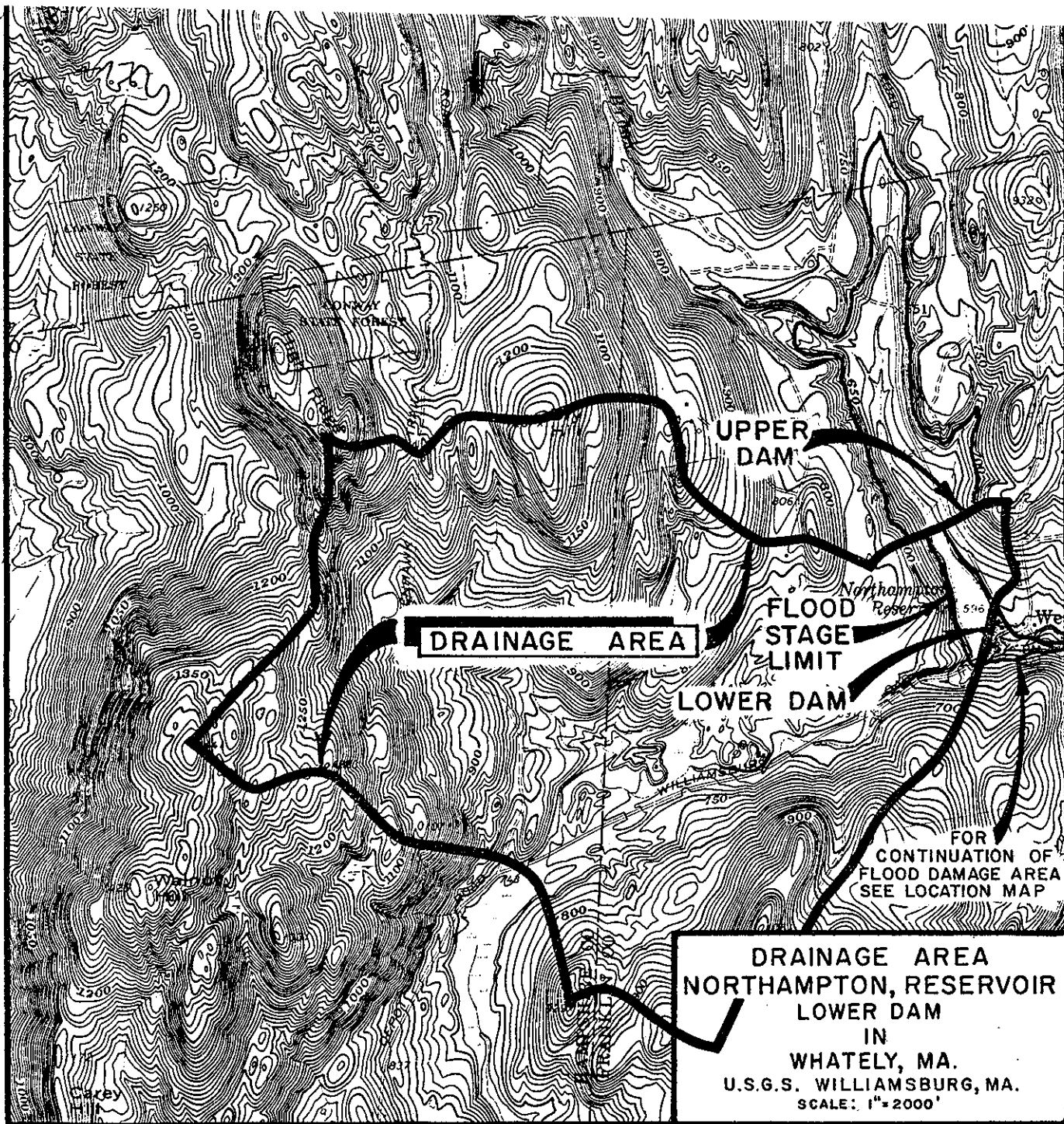
Spillway

<u>Q</u>	<u>Y</u>	<u>L</u>	<u>A</u>	<u>WP</u>	<u>R</u>	<u>R²/₃</u>	<u>S^{1/2}</u>	<u>$\frac{1.486}{n}$</u>	<u>$(S^x \times \frac{1}{n})$</u>	<u>V</u>
152	1	50'	50'	52'	0.962	0.974	0.0316	0.9906	3.13	3.05
473	2	↓	100'	54'	1.852	1.51	↓	↓	↓	4.71
911	3	↓	150'	56'	2.679	1.94	↓	↓	↓	6.07
1434	4	↓	200'	58'	3.448	2.29	↓	↓	↓	7.17
2029	5	50	250'	60'	4.167	2.60	0.0316	↓	↓	8.14

$$\frac{L_{AM}}{Y} \cdot \frac{L}{L} \cdot \frac{C}{C} \cdot \frac{W}{W} \cdot \frac{R}{R} \cdot \frac{R^{21/3}}{R^{21/3}} \cdot \frac{5^{1/2}}{5^{1/2}} \cdot \frac{1.486}{H} \left(5^{1/2} \cdot \frac{1.486}{H} \right) \cdot \frac{V}{V} \cdot \frac{Q + Q_s}{Q + Q_s}$$

Stage Discharge / Storage Curves





APPENDIX E

INVENTORY FORM